

CLAIMS

What is claimed is:

1. A hybrid substrate comprising:

a first semiconductor layer having a first crystallographic orientation; and

a second semiconductor layer having a second crystallographic orientation which is different from the first crystallographic orientation, wherein said first and second semiconductor layers are separated from each other by an interface, said second semiconductor layer has a thickness from about 200 nm to about 2 μ m and said interface has an oxide thickness of about 10 nm or greater.

2. The hybrid substrate of Claim 1 wherein said first semiconductor layer and the second semiconductor layer are composed of the same or different semiconductor material selected from the group consisting of Si, SiC, SiGe, SiGeC, Ge, GaAs, InAs, InP, other III/V or II/VI compound semiconductors and any combination thereof.

3. The hybrid substrate of Claim 1 wherein said first semiconductor layer and the second semiconductor layer are both composed of Si.

4. The hybrid substrate of Claim 1 wherein said first semiconductor layer has a (100) crystal orientation and said second semiconductor layer has a (110) crystal orientation.

5. The hybrid substrate of Claim 1 wherein said first semiconductor layer has a (110) crystal orientation and said second semiconductor layer has a (100) crystal orientation.

6. The hybrid substrate of Claim 1 wherein said first semiconductor layer comprises a relaxed semiconductor material or a stack of a relaxed semiconductor material and a strained semiconductor material.

7. The hybrid substrate of Claim 1 wherein said second semiconductor material comprises a relaxed semiconductor material or a stack of a relaxed semiconductor material and a strained semiconductor material.

8. An integrated semiconductor structure comprising:

a hybrid structure comprising a first device region having a first crystallographic orientation and a second device region having a second crystallographic orientation, said first crystallographic orientation is different from said second crystallographic orientation, wherein at least said first device region or said second device region includes a semiconductor layer having a thickness from about 200 nm to about 2 μ m and an underlying interface that has an oxide thickness of about 10 nm or greater;

an isolation region separating said first device region from said second device region; and

at least one first semiconductor device located in said first device region and at least one second semiconductor device located in said second device region.

9. The integrated semiconductor structure of Claim 8 wherein the first crystallographic orientation is (110) and the second crystallographic orientation is (100).

10. The integrated semiconductor structure of Claim 9 wherein said at least one first semiconductor device is a pFET and the at least one second semiconductor device is an nFET.

11. The integrated semiconductor structure of Claim 8 wherein the first crystallographic orientation is (100) and the second crystallographic orientation is (110).

12. The integrated semiconductor structure of Claim 11 wherein said at least one first semiconductor device is an nFET and the at least one second semiconductor device is a pFET.
13. The integrated semiconductor structure of Claim 8 wherein the first device region includes a regrown semiconductor material located atop a first semiconductor material, said regrown semiconductor material having the same crystallographic orientation as the first semiconductor material.
14. The integrated semiconductor structure of Claim 13 wherein said regrown semiconductor material is recessed and another semiconductor material is formed atop the recessed regrown semiconductor material.
15. The integrated semiconductor structure of Claim 14 wherein said another semiconductor material is a strained semiconductor or a stack comprising a relaxed semiconductor and a strained semiconductor.
16. The integrated semiconductor structure of Claim 8 wherein said first and second semiconductor device regions both include strained Si.
17. The integrated semiconductor structure of Claim 13 wherein said regrown semiconductor material comprises a strained semiconductor layer located atop a relaxed semiconductor layer.
18. The integrated semiconductor structure of Claim 18 wherein said hybrid structure comprising a hybrid substrate that comprises a first semiconductor layer having a first crystallographic orientation; and a second semiconductor layer having a second crystallographic orientation which is different from the first crystallographic orientation, wherein said first and second semiconductor layers are separated from each other by a

interface, wherein said second semiconductor layer has a thickness from about 200 nm to about 2 μ m and said interface has thickness of about 10 nm or greater.